WHAT IS CLAIMED IS:

1. A hydrodynamic bearing comprising:

a shaft member including a shaft having a cylindrical outer circumferential surface and an end surface which is orthogonal to the cylindrical outer circumferential surface, and a disc member having a diameter larger than that of said shaft and having a flat surface facing the end surface of the shaft, the flat surface being joined and fixed to said end surface of the shaft;

a bearing member having a cylindrical inner circumferential surface facing the cylindrical outer circumferential surface of said shaft and capable of rotating relative to said shaft member; and

a radial hydrodynamic bearing part formed between the cylindrical outer circumferential surface of said shaft and the cylindrical inner circumferential surface of the bearing member,

wherein in joint surfaces of said shaft and said disc member, a circumferential projection having a diameter smaller than an outside diameter of said shaft and projecting in the axial direction, and a recess at least of which outer periphery has a diameter smaller than the outside diameter of said shaft and larger than the diameter of the projection and has a circular shape are provided,

said projection is melted when a predetermined voltage

is applied across said shaft and said disc member in a state where the joint surface of said shaft and the joint surface of said disc member are in contact with each other, the melted matter is housed in said recess, an end surface of said shaft and a flat surface of said disc member are in contact with each other in a portion outside of said recess, and said shaft and said disc member are integrated by welding.

2. The hydrodynamic bearing according to claim 1, wherein said recess is a circular recess provided in one of the joint surfaces which are joined to each other, of said shaft and said disc member, and said projection from said recess is projected from the joint surface of said shaft.

3. The hydrodynamic bearing according to claim 2, wherein said recess and said projection are provided in an end surface of said shaft.

4. The hydrodynamic bearing according to claim 1, wherein said projection is provided for one of the joint surface of said shaft and the joint surface of said disc member, which are joined to each other and, said recess takes the form of an annular groove provided for the other one of the joint surface of said shaft and the joint surface of said disc member.

5. The hydrodynamic bearing according to claim 4, wherein for one of the joint surfaces of said shaft and said disc member, which are joined to each other, a recess which is

recessed from the joint surface is provided on the inner circumferential side of said projection.

6. The hydrodynamic bearing according to claim 5, wherein said projection is provided for an end surface of said shaft, and said annular groove is provided in a flat surface of said disc member.

7. The hydrodynamic bearing according to claim 1, wherein said projection and said recess are provided for one of joint surfaces of said shaft and said disc member, which are joined to each other and, for the other one of the joint surfaces of said shaft and said disc member, which are joined to each other, a circular projection having an outside diameter smaller than the outer periphery of said recess and larger than said projection, and projecting in the axial direction from the joint surface is provided.

8. The hydrodynamic bearing according to claim 7, wherein said recess is a circular recess, and said projection is positioned in the recess.

9. The hydrodynamic bearing according to claim 7, wherein said recess and said projection are provided for a flat surface of said disc member, and said projection is provided for an end surface of said shaft.

10. The hydrodynamic bearing according to claim 9, wherein said recess and said projection are formed by performing a press work on said disc member.

11. The hydrodynamic bearing according to claim 1, wherein said bearing member has a bearing surface facing one or both of surfaces of said disc member, and a thrust hydrodynamic bearing part is formed between said disc member and said bearing member.

12. A method of manufacturing a hydrodynamic bearing comprising:

a shaft member including a shaft having a cylindrical outer circumferential surface and an end surface which is orthogonal to the cylindrical outer circumferential surface, and a disc member having a diameter larger than that of said shaft and having a flat surface facing the end surface of the shaft, the flat surface being joined and fixed to said end surface of the shaft;

a bearing member having a cylindrical inner circumferential surface facing the cylindrical outer circumferential surface of said shaft and capable of rotating relative to said shaft member; and

a radial hydrodynamic bearing part formed between the cylindrical outer circumferential surface of said shaft and the cylindrical inner circumferential surface of the bearing member,

comprising the steps of:

providing, in joint surfaces which are joined to each other of said shaft and said disc member, a circumferential

projection having a diameter smaller than an outside diameter of said shaft and projecting in the axial direction, and a recess at least of which outer periphery has a diameter smaller than the outside diameter of said shaft and larger than the diameter of the projection and has a circular shape;

applying a predetermined voltage across said shaft and said disc member in a state where a pressure is applied in the axial direction to said shaft and said disc member so that the joint surface of said shaft and the joint surface of said disc member are in contact with each other;

melting said projection until the end surface of said shaft and the flat surface of said disc member come into contact with each other in a region outside of said recess and allowing a melted matter of the projection to enter said recess; and

thereby fixing said shaft and said disc member by welding.

13. A method of manufacturing a hydrodynamic bearing comprising:

a shaft member including a shaft having a cylindrical outer circumferential surface and an end surface which is orthogonal to the cylindrical outer circumferential surface, and a disc member having a diameter larger than that of said shaft and having a flat surface facing the end surface of the shaft, the flat surface being joined and fixed to said

end surface of the shaft;

a bearing member having a cylindrical inner circumferential surface facing the cylindrical outer circumferential surface of said shaft and capable of rotating relative to said shaft member; and

a radial hydrodynamic bearing part formed between the cylindrical outer circumferential surface of said shaft and the cylindrical inner circumferential surface of the bearing member,

comprising the steps of:

providing a circular recess having a diameter smaller than the outside diameter of said shaft and recessed in the axial direction, in one of the joint surfaces which are joined to each other, of said shaft and said disc member, and a circumferential projection which is projected in the axial direction from said one of the joint surfaces in the recess;

applying a predetermined voltage across said shaft and said disc member in a state where said shaft and said disc member are pressed against each other in a direction orthogonal to the axial direction so that the joint surface of said shaft and the joint surface of said disc member are in contact with each other;

melting said projection until the end surface of said shaft and the flat surface of said disc member come into contact with each other in a region outside of said recess

and allowing a melted matter of the projection to enter said recess; and

thereby fixing said shaft and said disc member by welding.

14. A method of manufacturing a hydrodynamic bearing comprising:

a shaft member including a shaft having a cylindrical outer circumferential surface and an end surface which is orthogonal to the cylindrical outer circumferential surface, and a disc member having a diameter larger than that of said shaft and having a flat surface facing the end surface of the shaft, the flat surface being joined and fixed to said end surface of the shaft;

a bearing member having a cylindrical inner circumferential surface facing the cylindrical outer circumferential surface of said shaft and capable of rotating relative to said shaft member; and

a radial hydrodynamic bearing part formed between the cylindrical outer circumferential surface of said shaft and the cylindrical inner circumferential surface of the bearing member,

comprising the steps of:

providing an annular groove having a diameter smaller than the outside diameter of said shaft and recessed in the axial direction, in one of the joint surfaces which are joined

to each other, of said shaft and said disc member, and a circumferential projection which has a diameter smaller than that of said annular groove and is projected in the axial direction from the other one of the joint surfaces and a recess having a diameter smaller than the projection in the other one of the joint surfaces which are joined to each other of said shaft and said disc member;

applying a predetermined voltage across said shaft and said disc member in a state where said shaft and said disc member are pressed against each other in a direction orthogonal to the axial direction so that the joint surface of said shaft and the joint surface of said disc member are in contact with each other;

melting said projection until the end surface of said shaft and the flat surface of said disc member come into contact with each other in a region outside of said annular groove and allowing a melted matter of the projection to enter said annular groove and/or said recess; and

thereby fixing said shaft and said disc member by welding.

15. A method of manufacturing a hydrodynamic bearing comprising:

a shaft member including a shaft having a cylindrical outer circumferential surface and an end surface which is orthogonal to the cylindrical outer circumferential surface,

and a disc member having a diameter larger than that of said shaft and having a flat surface facing the end surface of the shaft, the flat surface being joined and fixed to said end surface of the shaft;

a bearing member having a cylindrical inner circumferential surface facing the cylindrical outer circumferential surface of said shaft and capable of rotating relative to said shaft member; and

a radial hydrodynamic bearing part formed between the cylindrical outer circumferential surface of said shaft and the cylindrical inner circumferential surface of the bearing member,

comprising the steps of:

providing a circular recess having a diameter smaller than the outside diameter of said shaft and recessed in the axial direction and a circumferential projection positioned in the recess and projected in the axial direction, in one of the joint surfaces which are joined to each other, of said shaft and said disc member;

providing, in the other one of the joint surfaces which are joined to each other, of said shaft and said disc member, a circular projected part which has a diameter smaller than that of said recess and larger than that of said projection and is projected in the axial direction from the other one of the joint surfaces only by a dimension smaller than a

depth of said recess;

applying a predetermined voltage across said shaft and said disc member in a state where said shaft and said disc member are pressed against each other in a direction orthogonal to the axial direction so that the joint surface of said shaft and the joint surface of said disc member are in contact with each other;

melting said projection until said projected part enters said recess and the end surface of said shaft and the flat surface of said disc member come into contact with each other in a region outside of said recess and allowing a melted matter of the projection to enter said recess; and

thereby fixing said shaft and said disc member by welding.

16. An apparatus for manufacturing a shaft member for a hydrodynamic bearing, for joining a disc member to an end surface of a shaft so as to be substantially orthogonal to the axis of the shaft by resistance welding, comprising:

a pair of electrodes disposed so as to face each other in the axial direction in order to press said shaft and said disc member against each other in a direction orthogonal to the axial direction and to apply a predetermined voltage to said shaft and said disc member; and

an axis adjusting jig for making the axis of said shaft and a center position of said disc member coincide with each

other,

wherein said axis adjusting jig comprises: a cylindrical shaft holding part in which said shaft is inserted, thereby positioning the axis of said shaft in a predetermined position and holding said shaft; and an annular-shaped disc member holding part in which said disc member is press fit, thereby positioning the center position of said disc member in a predetermined position and holding said disc member, and

the disc member holding part is made of a resin.

17. A spindle motor comprising:

a shaft member including a shaft having a cylindrical outer circumferential surface and a disc member joined to an end surface of the shaft;

a bearing member having a cylindrical inner circumferential surface facing the cylindrical outer circumferential surface of said shaft and capable of rotating relative to said shaft member;

a radial hydrodynamic bearing part formed between the cylindrical outer circumferential surface of said shaft and the cylindrical inner circumferential surface of the bearing member;

a rotor coupled to one of said shaft and said bearing member and having a rotor magnet; and

a stator constructing a stationary member in

cooperation of the other one of said shaft and said bearing member and disposed so as to face said rotor magnet,

wherein in joint surfaces which are joined to each other of said shaft and said disc member, a circumferential projection having a diameter smaller than the outside diameter of said shaft and projecting in the axial direction and a recess of which at least outer periphery has a diameter smaller than the outside diameter of said shaft and larger than the projection are provided,

said projection is melted when a predetermined voltage is applied across said shaft and said disc member in a state where the joint surfaces of said shaft and said disc member are in contact with each other,

a melted matter is housed in said recess, and

an end surface of said shaft and a flat surface of said disc member come into contact with each other in a portion outside of said recess, thereby integrating said shaft and said disc member by welding.

18. A recording disk apparatus comprising a spindle motor according to claim 17,

wherein a recording disk is mounted on said rotor so as to rotate integrally with the rotor, and

a recording/reproduction head for reading/writing information from/to the recording disk is provided.